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Dendroarchaeology of late-neolithic timber in the Federseebasin

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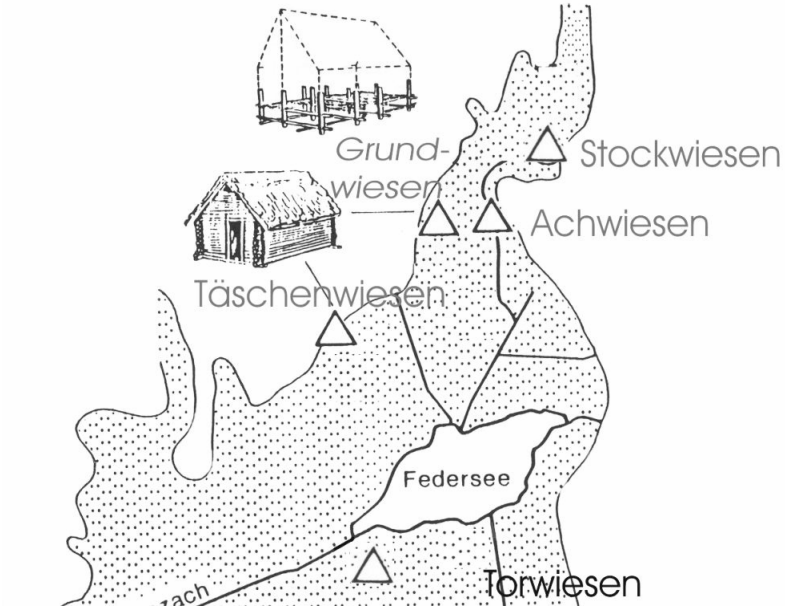
Time and space

Lake Constance and the moors around the Federsee have yielded numerous and well-known archaeological settlements mostly from the stone-age and the bronze-age. Among the most prominent features of these settlements are the many well preserved timbers. While the bronze-age timbers of both regions and those from the stone-age at lake Constance have been intensively studied by A. Billamboz (Billamboz 2006 a, b) those of the late Neolithic in the Federseebasin have not yet been studied in detail (Map 1). This is the project of a doctoral thesis soon to be finished at the University of Mainz. The aims are of course the dating and chronology-building and an analysis of the ecological and economical framework of the settlements. These are important aspects since the late-neolithic shows striking and hitherto unexplained features in the archaeological and pollen-record. Although we have found several settlements, the pollen-data widely lack cereals as well in on-site- and off-site-data. At earlier centuries the archaeological evidence clearly corresponds to the amount of cereal-type pollen (Liese-Kleiber 1995). So obviously something has changed in the economy at the same time that also witnesses the introduction of cart and wheel. The findings of more than 8000 timbers from the late-neolithic gave the opportunity to search for explanations and mechanisms of cultural behaviour in response to environmental change and to promote our knowledge of the dating, settlement-dynamics and thereby also the demography.



Map 1: The late-neolithic settlements in the Federsee-basin.

Difficult analyses

The material was not optimal since it turned out to be mainly made up of short tree-ring-curves of ash (*Fraxinus excelsior*), beech (*Fagus sylvatica*) and alder (*Alnus glutinosa*) as well as many species of minor importance like birch (*Betula sp.*), poplar (*Populus sp.*), willow (*Salix sp.)* and others. Moreover the curves were often quite dissimilar. Due to the restricted length of the curves statistical cross-dating was not reliable and the cross-dating was carried out visually. The measurements were sometimes hindered by the bad state the samples were in. Farmers had drained the peat-meadows in which the remains were embedded and thus the preservation was often poor. In many cases it was either impossible to achieve thin-sections or surfaces to measure the samples or the outer millimeters were heavily damaged so that the last rings were not measurable. In several cases it was helpful to soak the samples in resin like Melamin. After the resin has hardened it is sometimes possible to achieve thin sections and surfaces that can be measured.

The example of 'Alleshausen-Grundwiesen'

Material and methods

The settlement of Alleshausen-Grundwiesen yielded a complex stratigraphy with many building-structures one on top of the other as well as next to one-another (Fig.1). This stratigraphy is characterised by a thick dung-layer (layer 107) that covers large parts of the settlement (Schlichtherle 2004).

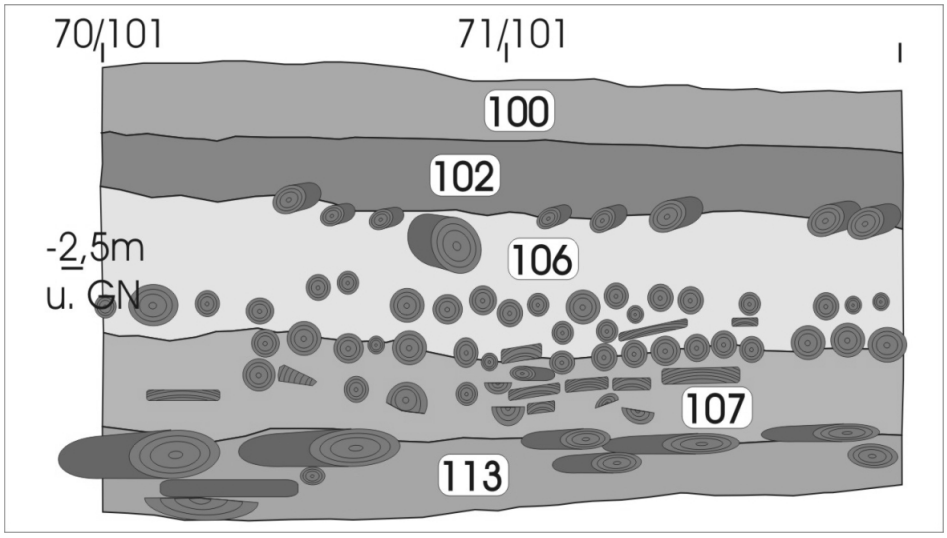


Figure 1: Example from the stratigraphy of Alleshausen-Grundwiesen with different archaeological layers (numbered) and wooden remains of the architecture.

At first, it turned out to be impossible to build a reliable chronology from this material. In an interdisciplinary fusion of archaeological and dendrochronological methods the archaeological identification of 'closed finds' (an ensemble of things that have been layed down at the same time) was used to define small groups of timber among which to look for similarities of the tree-ring curves. The visually cross-dated curves were averaged into small chronologies for single buildings. The stratigraphic sequence of the houses provided the

relative dating and important information for the cross-dating of the short building-chronologies. Thus it was possible to construct preliminary floating chronologies for the site for beech, alder, ash and birch. These curves were build with sometimes as few as 20 year-rings (Fig.2). All these synchronisations are of the dating-level ‘C’, meaning that they are rather proposals of the most probable synchronisation relying on external information (see Billamboz 1998, 164).

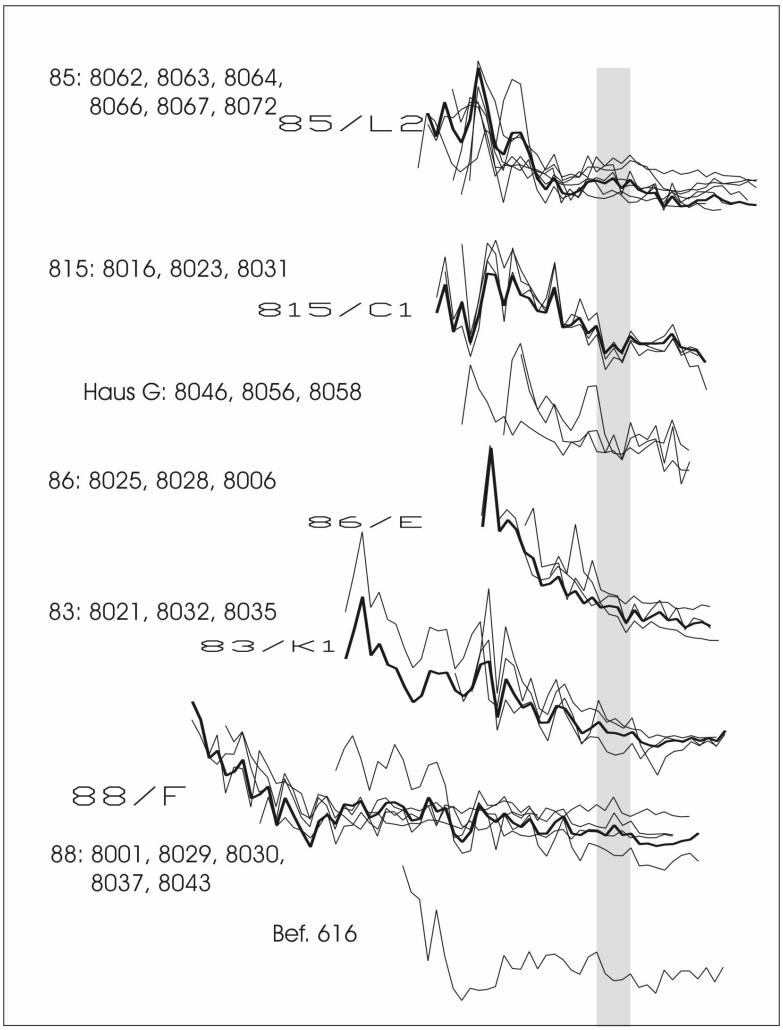


Figure 2: An example of short building-internal chronologies in stratigraphical order.

Results

It turned out that the small and lightly-built houses were in use for only very few years and in some cases in fact were probably rebuilt every year. For houses that were rebuilt within three years lay one on top of the other, with the lower house bearing traces of repairs. This had already been hypothesized by the excavator H. Schlichtherle since the houses have often just a size of some 4x4m and no plaster on the thin walls thus being hardly a place to stay during winter.

The dung-layer mentioned above yielded many thousands of twigs of which over 80% consist of ash (Maier 2004), while ash made up only about 3% of the timber.

Discussion

The identification of the species already hinted at a main-function of Alleshausen-Grundwiesen as a specialized seasonal settlement where cattle was kept and fed with ash-leaves. For this reason the ash trees were spared and not cut for timber. But the interpretation as a seasonal camp dependant on another village – probably larger and more permanent – depended mainly on the dendrochronological result of permanently rebuilt seasonal houses. This is the first time in archaeology such a second-order settlement was found although alike phenomena have been sometimes theoretically postulated (Schibler et al 1997, 347).

The example of Seekirch-Stockwiesen

Material and methods

This settlement was mainly built of ash and beech, where the ashes were primarily used for posts and the beech for the floors. The felling-dates revealed intensive recycling of old wood and a short inhabitation of less than ten years. The beeches showed a remarkable feature in their rings (Fig.3).

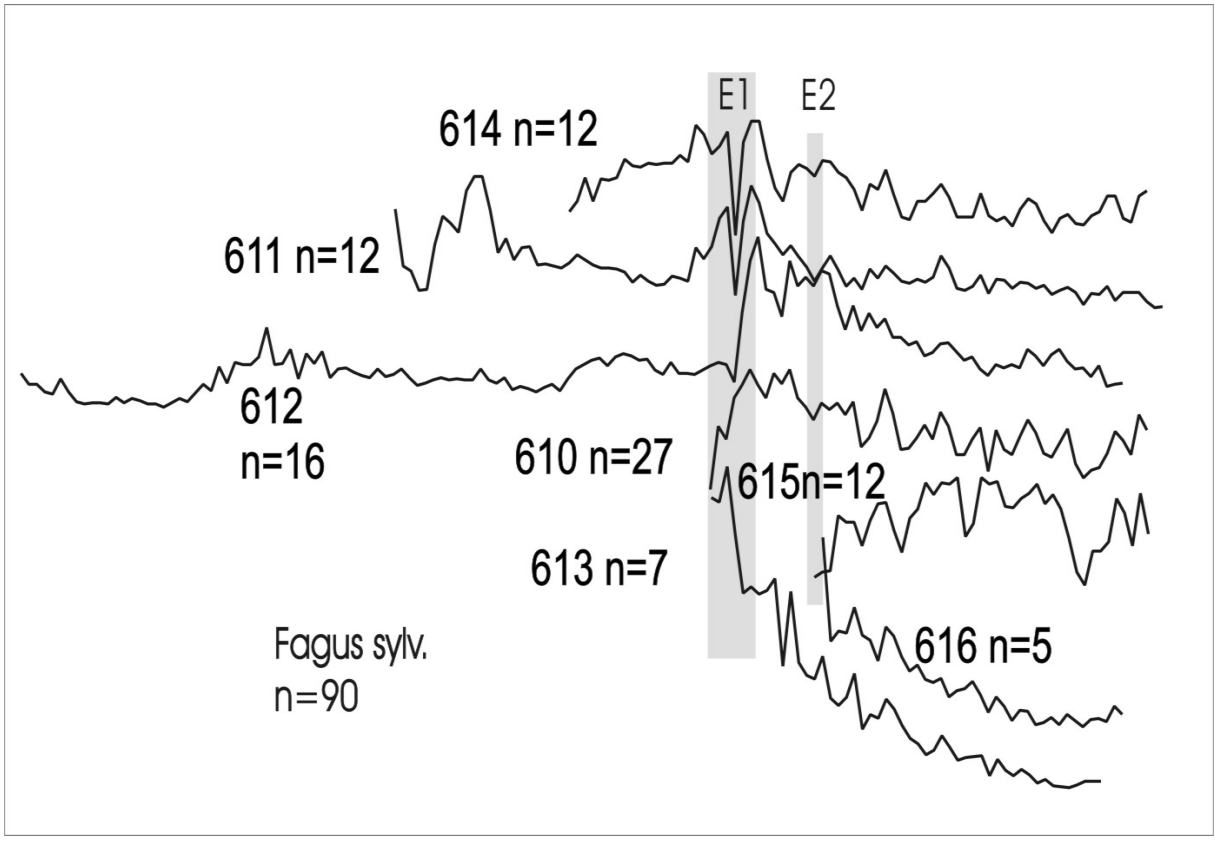


Figure 3: The dendro-groups of beech in the settlement Seekirch-Stockwiesen. Event 1 marks the first germination-phase and growth recovery, event 2 the second germination-phase.

After the dendrotypological sorting two groups could be identified that showed very narrow rings over a prolonged period of time. The trees of one of these groups (DG 612) suddenly and synchronously recovered and from this year onwards show rather normal and mostly undisturbed age-trends (event 1) although the mean ring-width is still very low (~0.5mm).

The other group shows some asynchronous recovery within the five preceding years (DG 611). Synchronously to the recovery several groups of younger trees begin their growth. The largest dendro-group DG 610 shows a moderate and also mostly undisturbed age-trend with narrow year-rings, while the dendro-group 613 shows a more pronounced trend with wide rings in the first years. About ten years later two more dendrogroups (DG-615 and DG616) begin their growth synchronously – again one of them with a steep age-trend and the other one without (event 2). Synchronous to the first germination and recovery-phase in beech, as well the ashes as the alders start to grow. Furthermore they both show a second germination-phase some ten years later which is again synchronous to the beginning of the beech-dendro-groups DG615 and DG616.

To evaluate the quality of the chronology and the difference between the growth before and after event 1 the eps of the mean-chronology of all beech-dendro-groups was calculated (Fig.4). It is clear, that the visually constructed chronology has a strong common signal after event 1 in the relative year 100 but a poor one before.

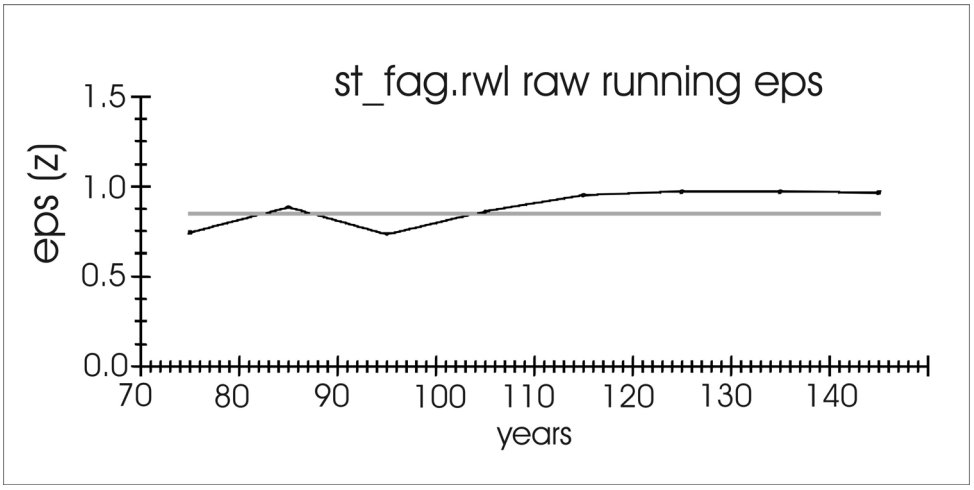


Figure 4: The eps of the beech-chronology of the Stockwiesen-settlement

Discussion

The event 1 is very probably of anthropogenic origin. The strong negative pointer year in the relative year 100 is not a late-frost event, since thin-sections of beech-samples show no traces of collapsed vessels. The straight and branch-free shape of the stems shows that they have grown in a dense stand of juvenile trees (Peters 1997, 59, 70f.), whose growth has been triggered by the same event. It appears unlikely that a storm-event should be able to destroy

enough dominant trees in several stands on different soils to explain a massive rejuvenation-phase in different species. Furthermore several individuals start their recovery earlier and some of the young trees (dendro-group 613) exhibit tree-rings whose cumulative growth-curves resemble oak-coppice-shoots in having conspicuous wide rings in the juvenile wood (Haneca et al. 2006) (Fig. 5). This is why this combination of features is interpreted as the traces of an athropogenic event.

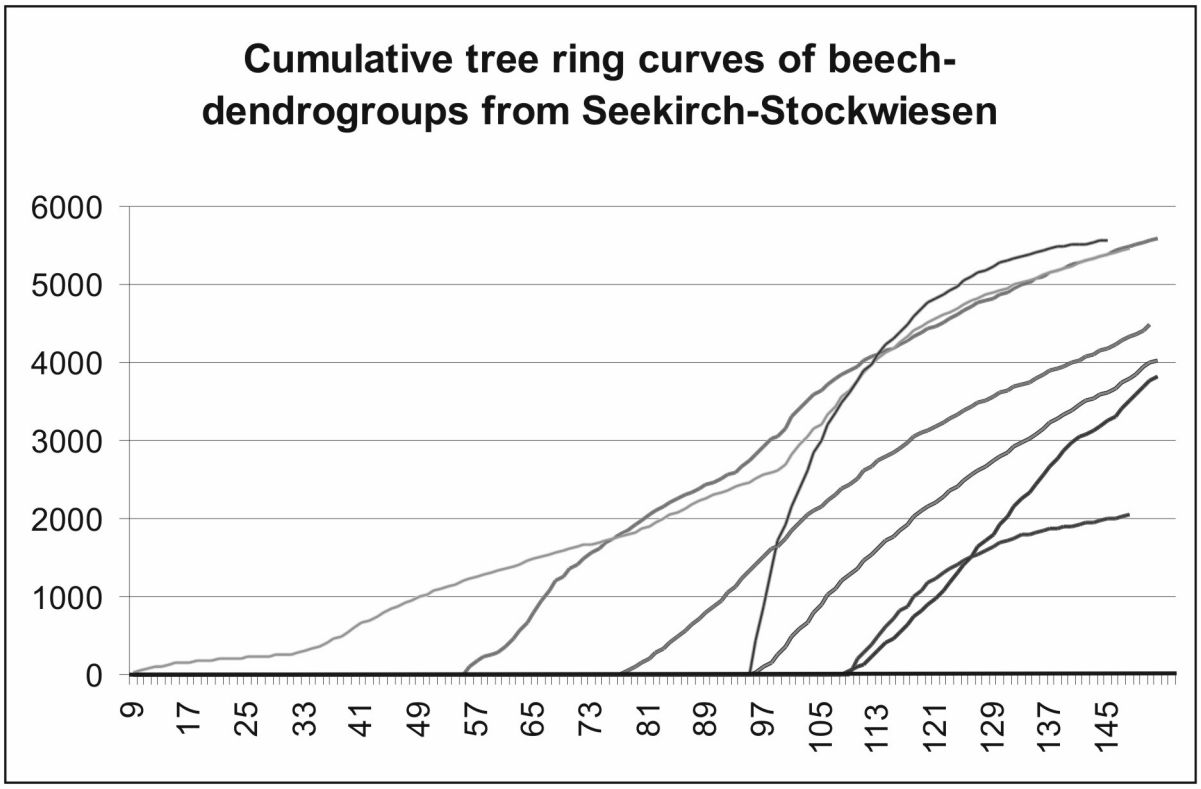


Figure 5: Cumulative growth-curves of the dendro-groups of beech. Groups 613 and 615 show a distinct trend resembling those of coppice-shoots.

It is not yet clear, of what kind this anthropogenic impulse was. Further anatomical studies are being carried out searching for features that shed some light on the ecological conditions and thus on the economic processes.

The typical anatomical reaction to light-shortage of dwarfed-individuals from the undergrowth as a lower vessel-density, lower vessel-diameter, lower ring-width and few flat fibre-cells at the ring-boundary in the late-wood that are also poorly lignified (Schweingruber & Schöne 1999) have been found in thin-sections of both beech and ash.

Interpretation

The event 1 is the result of some anthropogenic economic activity that in a short time but not completely synchronously changed the growth-conditions of the undergrowth on larger spaces both on wet and dry soils. Possible explanations are the removal of the dominant trees to induce strong growth of weeds, grass and young trees that were needed as cattle-fodder or else the sudden release from grazing. Other interpretations are possible and currently more analyses are being carried out in order to find the most probable explanation. The analysis of this succession, mirrored in the tree-rings, will hopefully give more answers concerning the economic structure of the people in the late-neolithic in the Federsee-basin.

Up to now the studies already showed that there existed different kinds of settlements that differed in respect to their durability, the repeated inhabitation, the economic specialisation and use of woodland.

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